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DATE: May 12, 2003 **Action Item #: 1705**
RE: AMS-02/ROEU PDA Clearance Assessment
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PAGES: 4

The MAGIK Robotic Analysis Team has assessed the newest design configuration for the Alpha Magnetic Spectrometer (AMS) on the S3 truss. This memo documents the clearances between the AMS and the Express Pallet (EXP) installed to the neighboring S3 Payload Attach System (PAS). Similar analyses for previous AMS designs were examined in MAGIK action items 1110, 1146, 1174, 1192, and 1254. The most notable difference in this AMS design is the extension of the Remotely Operated Electrical Umbilical (ROEU) Payload Disconnect Assembly (PDA) by more than six inches. This extension is in the direction of the EXP on the S3 Outboard-Upper PAS and therefore impacts the clearance between the two payloads.

Assumptions:

- The AMS 3D CAD model was received from Ross Harold/Lockheed in May 2003.
- The AMS is installed to the S3 Inboard-Upper PAS.
- The EXP is installed to the S3 Outboard-Upper PAS.
- Since the EXP design is very preliminary, distance measurements were taken from the AMS model to the Attached Payload Envelope, as defined in SSP 57003, Figure 3.1.3.1.1.1-1.
- The distance (ISS +Y) from the center of the Inboard S3 PAS to the center of the Outboard S3 PAS is 113.38 inches
- This analysis addresses clearance issues by measuring distances between 3D graphic models. Areas not addressed in this document - lighting, viewing, EVA/EVR tasks, thermal and/or pressure effects on elements, and dynamics - could have a significant influence on the measurements and overall feasibility.
- 3D graphical models used in this analysis are a result of the MAGIK Team's "best efforts" to obtain/create accurate models reflecting actual volumetric dimensions of the various ISS elements. "Best efforts" include obtaining models directly from the ISS CAD Modeling Team, the hardware designers, or a 3rd party (a source other than the hardware designers), or creating models from hardware designer or customer provided drawings/information.
- Pedigree information for pertinent models may be obtained from the MAGIK Team upon request.

[Figure 1](#) shows the AMS and EXP on the S3 upper attach sites. The red transparent envelopes shown in the picture represent the attached payload envelopes (SSP 57003). The best available model for the EXP is shown inside the outboard-upper envelope for reference. This figure shows that when both payloads are fully mated, the clearance between the AMS (specifically the ROEU) and the outboard payload envelope is 9.7 inches.

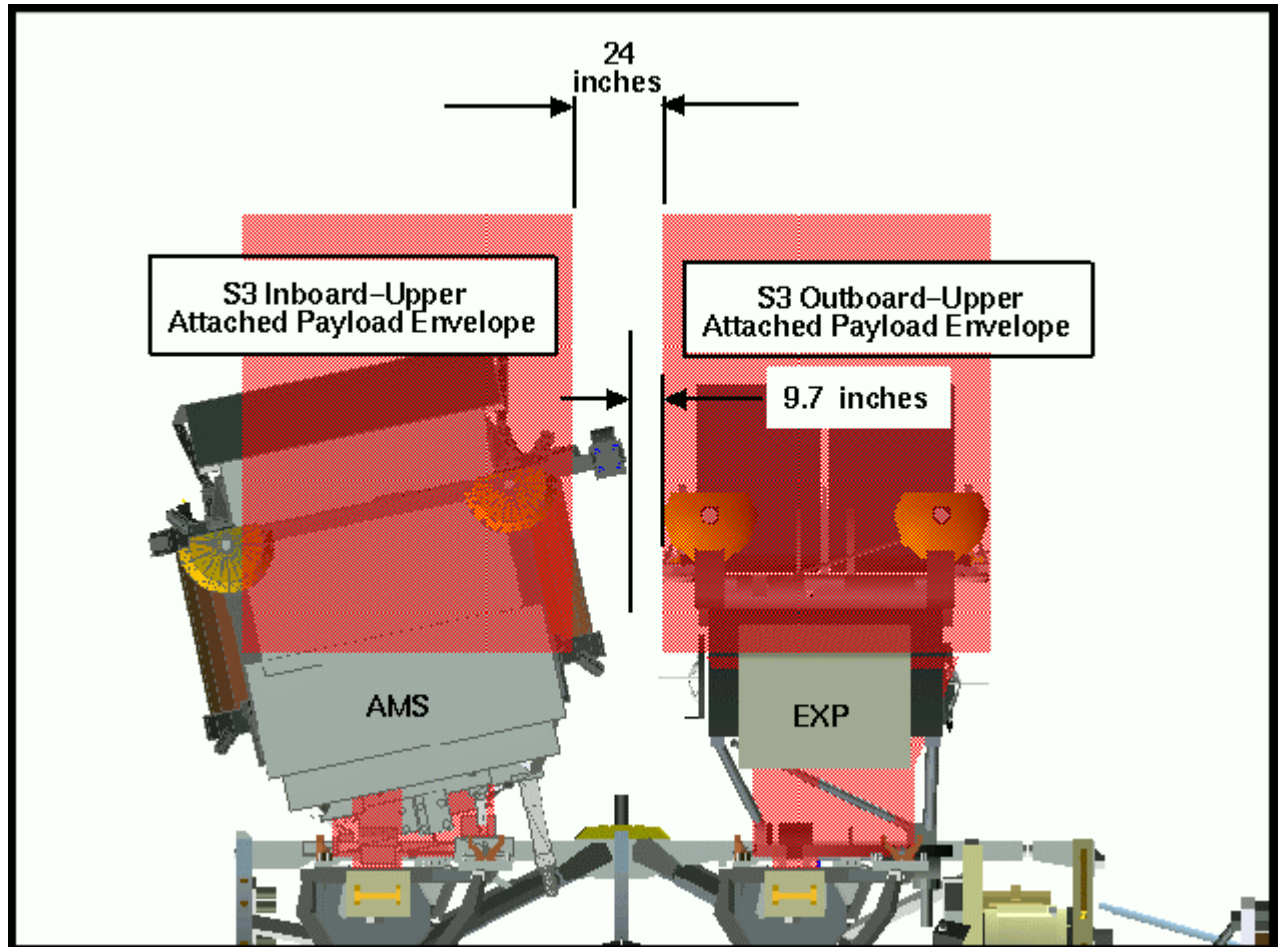


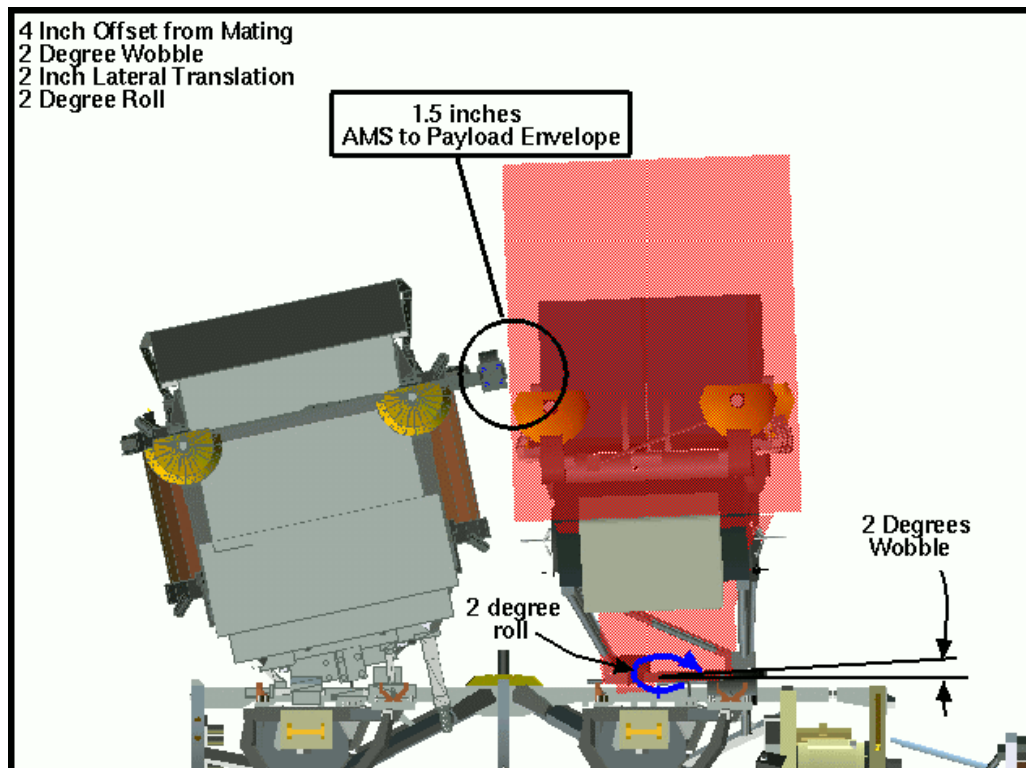
Figure 1: AMS and EXP Berthed to the S3 Truss – ISS Back View

Table 1 below lists the clearance between the AMS and the outboard payload envelope assuming the outboard payload is installed when the AMS is already present. The maximum misalignments used (2 degrees wobble, 2 inches lateral offset, and 2 degrees roll) were assumed based on input from MAGIK Action Item 1254 (previous AMS configuration analysis). Assuming the maximum misalignments, the clearance between the payloads is 1.5 inches when the incoming payload is nearly installed. The farther away from installation the payload is, the better the clearance to the AMS. With no misalignments, the clearance is 9.7 inches. [Figure 2](#) and [Figure 3](#) show the clearance between the AMS and the outboard upper envelope during the installation.

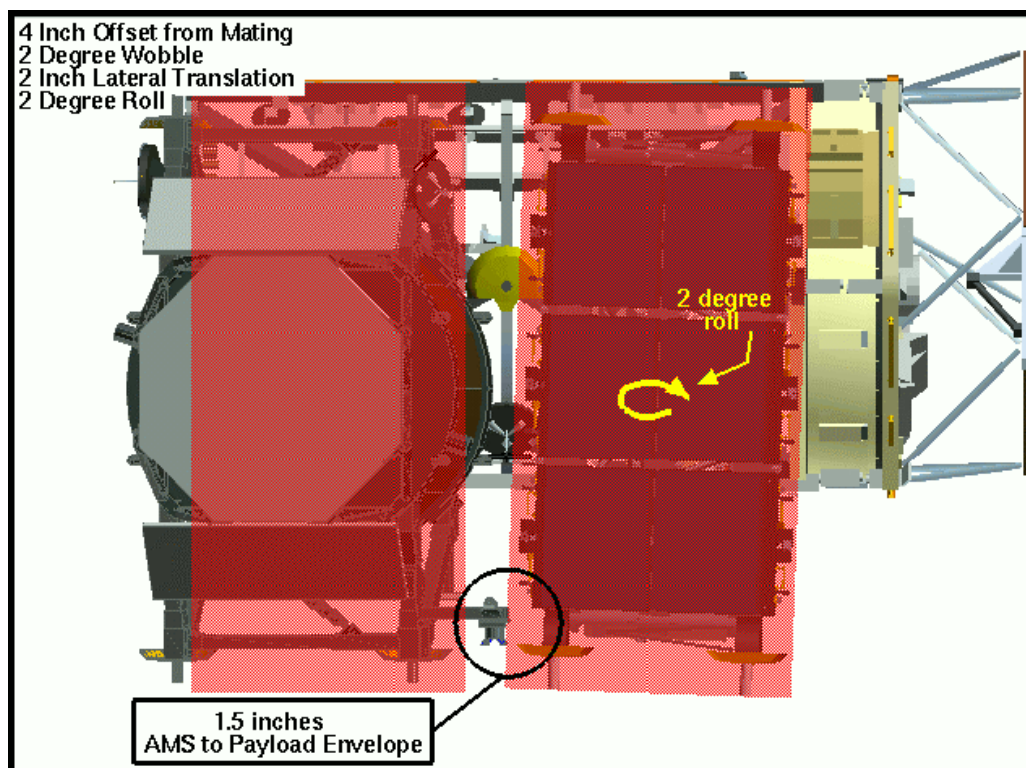
Table 1 – Clearance Between PAS Payloads

Distance Between Passive And Active Halves of PAS (inches)	Clearance Between AMS and Outboard Payload Envelope				
	0, 0, 0 Misalignments (Wobble, Lateral Offset, Roll) (deg, inches, deg)	2, 2, 2 Misalignments (Wobble, Lateral Offset, Roll) (deg, inches, deg)	2, 0, 2 Misalignments (Wobble, Lateral Offset, Roll) (deg, inches, deg)	2, 2, 0 Misalignments (Wobble, Lateral Offset, Roll) (deg, inches, deg)	0, 2, 2 Misalignments (Wobble, Lateral Offset, Roll) (deg, inches, deg)
0	9.7	N/A*	N/A*	N/A*	N/A*
4	9.7	1.5	3.5	4.2	5.1
8	9.7	1.7	3.6	4.4	5.1
12	9.7	1.8	3.8	4.5	5.1
16	9.7	1.9	3.9	4.6	5.1
20	9.7	2.1	4.1	4.8	5.1
24	9.7	2.2	4.2	4.9	5.1
28	9.7	2.3	4.3	5.1	5.1
40	9.7	2.8	4.8	5.5	5.1
50	9.7	3.1	5.1	5.8	5.1

* No misalignments are feasible if the payload is berthed to the PAS.



**Figure 2: Clearance Between AMS and Outboard Envelope with Payload Misalignments
ISS Back View**



**Figure 3: Clearance Between AMS and Outboard Envelope with Payload Misalignments
ISS Top View**